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Comparative clinical evaluation of anaesthetic combination of romifidine-ketamine-isoflurane and romifidine-propofol-isoflurane for various surgeries in goats

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Abstract
The study was carried out to evaluate the feasibility of romifidine sedation for ketamine or propofol-isoflurane general anaesthesia for various surgeries in goats. The study was carried out in 12 clinical cases of goats presented for various surgical procedures and were randomly divided into two groups consisting of six goats in each group. The goats of both the groups were premedicated with romifidine hydrochloride (50 µg/kg, IV). After ten minutes the animals of group I and II were induced with ketamine (6 mg/kg, IV) and propofol (6 mg/kg IV) respectively then anaesthesia maintained with isoflurane (1-2%) in both the groups. Onset of sedation, down time to sternal recumbency were faster in both the groups. Ketamine-isoflurane was associated with better haemodynamic stability in comparison to propofol-isoflurane. However, propofol induction had advantage of excellent sedation and muscle relaxation. The preanesthetic and the general anaesthetic combinations followed in both the groups provided satisfactory surgical plane of anaesthesia and were ideal and safe to perform major surgeries in goats without any complications.

Keywords: Goats, romifidine, ketamine, propofol, sedation, isoflurane

Introduction
Anaesthesia is an indispensable prerequisite for most surgical interventions both in humans and in animals. Use of different anaesthetic drugs (local or general) has mainly been responsible for the advancement of veterinary surgery. General anaesthesia is preferred for complete unconsciousness, freedom from pain, loss of motor power and absence of reflex response and thus enable the surgeon for careful dissection and delicate treatment of tissues. It is produced by controlled reversible intoxication of central nervous system (Lumb and Jones 1984) [13]. In ruminants the use general anaesthesia is usually avoided due to complications like regurgitation, tympany, internal suffocation and hypersalivation. Most of the surgical interventions are carried out under either local analgesia or regional blocks. Caprine are delicate and quite sensitive to pain among the ruminants. Even the minor surgical procedure requires desensitization of the area involved. Preanaesthetics are used to facilitate smooth induction and recovery *viz*., tranquilizers, sedatives and narcotics have been used for premedication. Romifidine is a specific and relatively new alpha-2-adrenergic agonist drug that is mostly administered systemically to bring about sedation and analgesia (England *et al.*, 1992) [7]. Romifidine is a potent and selective alpha-2 adrenoceptor agonist that produces similar cardiorespiratory effects to other drugs of this group. In horses, romifidine produced a longer sedation than xylazine (England *et al.*, 1992 and England and Clark, 1996) [7, 8]. Effect of several doses of romifidine have been compared in dogs. No difference in sedation was observed among these doses, however higher doses produced a more consistent effect. The use of romifidine is attributed only to its sedative effect. Ketamine produces profound analgesia without muscle relaxation that is characterized by catatonic and amnesia with or without actual loss of consciousness (Hall and Clarke, 1991) [19]. Ketamine could be used for anaesthesia in sheep and goats however it might cause convulsions. The surgical anaesthesia and muscle relaxation is poor, however it might be improved by sedatives such as diazepam, xylazine and detomidine (Durgun *et al.*, 1990 and Afshar *et al.*, 2005) [6, 1].

The most frequently used anaesthetic combinations in goats are ketamine-xylazine, ketamine-medetomidine and tiletamine -zolazepam (Lumb and Jones, 1996) [20]. For anaesthesia in the goat, medetomidine (Mohammad *et al.*, 1989) [20] or a combination of drugs has been used (Pawde *et al.*, 1996; Afshar *et al.*, 2005 and Mahmood and Mohammad, 2008) [16, 1, 14]. Pharmacokinetic studies in various species have revealed that propofol has a high volume of distribution, rapid metabolism and rapid clearance when given by repeated doses or continuous intravenous (IV) infusion (Langley and Heel, 1988; Hall *et al.*, 1994 and Bettschart- Wolfensberger *et al.*, 2000) [11, 9, 4]. The rapid onset and short duration of action, with rapid recoveries make the drug potentially useful in ruminants, in which these features are particularly desirable. Isoflurane is a commonly used inhalant anaesthetic agent, which has short induction and recovery times because of its low lipid solubility coefficient (Antognini and Eisele, 1993) [3]. The most likely mechanism by which isoflurane produces anaesthetic effects is potentiation of the GABA receptor-channel complex in the brain and spinal cord (Larsen *et al.*, 1998) [12]. Isoflurane, like most other inhalant anaesthetic agents, causes respiratory depression, hypotension and reduced cardiac output in a dose-dependent pattern (Antognini and Eisele, 1993 and Hikasa *et al*., 2002) [3, 10]. Romifidine has been evaluated for in trathecal use in goat. There is paucity in literature on usage of romifidine with ketamine or propofol for induction and maintenance of anaesthesia with isoflurane.

Materials and Methods

Sources of research animals

The present clinical study was carried out in 12 clinical cases of goats of either sex presented for various surgical procedures at Veterinary College, Bidar. All the goats were randomly divided into two groups consisting of six goats in each group.

Preanesthetic preparation of animals

All the animals were kept off feed for 12 to 24 hours depending on age of animal and water was withheld for 6-12 hours prior to anaesthesia and surgery. Adequate pre-operative fluid therapy was given to all the animals. The clinical status of the animals was assessed by recording heart rate, respiratory rate and rectal temperature and by estimating haematological and biochemical parameters prior to anaesthesia.

Procedure of the study

Sedation and induction

The goats in Group-I were premedicated with romifidine hydrochloride at the dose rate of 50 µg/kg body weight intravenously. After ten minutes of romifidine administration, the animals were restrained in lateral recumbency and anaesthesia was induced by administering ketamine at the dose rate of 6 mg/kg body weight intravenously. The animals were maintained under isoflurane anaesthesia. In the Group-II, animals were administered with romifidine hydrochloride at the dose rate of 50 µg/kg body weight intravenously. After ten minutes, the animals were restrained in lateral recumbency and anaesthesia was induced by administering propofol intravenously at the dose rate of 6 mg/kg body weight. The animals were maintained under isoflurane anaesthesia.

Maintenance of anaesthesia

The anaesthetic machine was used to maintain anaesthesia with isoflurane. Semi closed system was used for all animals. The 100% oxygen was given with flow rate set at 2 litres per minute for the first two minutes to increase the fraction of inspired oxygen concentration. The fresh gas flow rate was then reduced to one to two litres per minute based on the size of the animal. Initially isoflurane was given with vaporizer setting at 3%, until downward rotation of eyeball. Later vaporizer setting was reduced to 1-2%. The vaporizer setting was altered during anaesthesia, as and when required to maintain uniform surgical plane of anaesthesia.

Evaluation

To evaluate the efficacy of anaesthetic protocol, the following parameters were recorded before, during and after anaesthesia.

Clinical observations

Onset of sedation (minutes)

The time taken from administration of preanesthetic drug *viz.*, romifidine hydrochloride in (Group I) and (Group II) to the development of ataxia, drooping of eyelids and drowsiness in animals was considered as onset of sedation.

Down time to sternal recumbency

The time taken by the animal to sit down on its own to sternal recumbency after administration of preanesthetic was considered as down time (attainment to sternal recumbency, Nikhit, 2017) [15].

Degree of sedation

Degree of sedation was evaluated by observing extent of head drop, respiratory pattern, movement of limb and tail, nystagmus and response to pain at 10 minutes after premedication.

Induction time

It is the state or condition in which the animal start becomes unconscious, not responding to painful stimuli with disappearance of selected reflexes.

Abolition of reflexes

Abolition of pedal, palpebral and corneal reflexes and animal behavior were evaluated at 10 minutes after premedication and at 30, 60 and 120 minutes after induction of general anaesthesia.

Degree of analgesia and anaesthesia

Analgesia was recorded by observing the animal response to deep prick on the rib and at the coronary band with a 22 G needle and was graded on 0-3 scale. In addition, analgesia was determined by response of animal to surgical pain. Degree of analgesia was recorded before premedication (0 minute), 10 minutes after premedication and at 5, 15, 30, 60 and 120 minutes after induction of general anaesthesia (Amarpal *et al.*, 2001) [21].

Table 1: Degree of analgesia and anaesthesia

Scale	Description
0	No analgesia: Strong reaction to pin pricks or surgical manoeuvres
1	Mild analgesia: Weak reaction to pin pricks or surgical manoeuvres
2	Moderate analgesia: Occasional response to pin pricks or surgical manoevrs
3	Good analgesia: No response to pin pricks or surgical manoeuvres

Degree of muscle relaxation

Degree of muscle relaxation was assessed by observing abdominal muscles and reduced resistance to passive flexion of the limb and graded on 0-3 scale. This was observed before premedication (0 minute), 10 minutes after premedication and at 5, 15, 30, 60 and 120 minutes after induction of general anaesthesia (Nikhit, 2017) [15].

Table 2: Degree of muscle relaxation

Scale	Description
0	No muscle relaxation
1	Mild muscle relaxation
2	Moderate muscle relaxation
3	Excellent muscle relaxation

Table 3: Degree of salivation

Scale	Description
0	No salivation
1	Mild salivation
2	Moderate salivation
3	Severe salivation

Degree of salivation

Extent of salivation was recorded and graded on 0-3 scale before premedication (0 minute), 10 minutes after premedication and at 5, 15, 30, 60 and 120 minutes after induction of general anaesthesia (Nikhit, 2017) [15].

Recovery time to regain sternal position (minutes)

The time taken by the animal from discontinuation of inhalant agent to the spontaneous regaining to swallowing reflex (minutes) is considered as recovery time to regain swallowing reflex.

Recovery time to regain standing position (minutes)

The time taken by the animal from discontinuation of inhalant agent to the spontaneous regaining to standing position is considered as recovery time to standing position.

Statistical analysis

The mean and standard error of all parameters were computed as per Snedecor and Cochran (1994) [18]. The variations in clinical, physiological, haemodynamic, haematological and biochemical parameters were compared at different time intervals within the group and between the groups and were analysed using student's' test as described by Snedecor and Cochran (1994) [18].

Table 4: Design of the technical programme of the clinical study

Sl. No.	Groups	Number of animals	Surgeries performed	Anaesthetic protocol
1	Group- I	6	Surgical repair of tibial fracture using IILN	Induction: Romifidine[1] (50 µg/kg, IV) Ketamine[2] (6 mg/kg, IV) Maintenance: Isoflurane[3] (1-2%)
			Surgical repair of tibial fracture using Steinmann pinning	
			Oesophageal obstruction- Oesophagotomy	
			Application of fiberglass for fracture of left metatarsal bone.	
			Plating for fracture of right radius and ulna bones	
			k-nailing for left femur bone fracture	
2	Group – II	6	Surgical repair for left teat injury(ablation)	Induction: Romifidine[1] (50 µg/kg, IV) Propofol[4] (6 mg/kg, IV) Maintenance: Isoflurane[3] (1-2%)
			Application of fiberglass for fracture of left metatarsal bone.	
			Plating for fracture of left tibial bone	
			Plating for fracture of left femur bone	
			Castration by open method	
			Application of fiberglass for fracture of left radius and ulna bone	

Results

Clinical observations

Onset of sedation (Seconds)

Intravenous administration of romifidine showed incoordination in movements, raising of head and drooping of lower lip within 10-25 sec of romifidine injection were commonly observed signs in animals of both groups.

Table 5: Mean±S.E of onset of sedation (seconds) in goats of groups I and II

Parameter	Groups	Mean±SE
Onset of sedation (seconds)	Group I	10.80±1.21
	Group II	10.60±0.97

Non-significant difference between the groups.

Onset of sedation with romifidine in both groups was 0.18±0.02 minutes (Group I) and 0.17±0.015 minutes (group II). Similar observations 0.16 to 0.25 minutes in goats were recorded by Saxena *et al.* (2001) [17] with intravascular of romifidine (12 µg/kg body weight).

Down time to sternal recumbency (minutes)

The down time to sternal recumbency was non-significant in both the groups premedicated with romifidine hydrochloride at the dose rate of 50 µg/Kg I/V.

Table 6: Mean±S.E of down time to sternal recumbency (minutes) in goats of groups I and II

Parameter	Groups	Mean±S.E
Down time to sternal recumbency (minutes)	Group I	5.60±0.38
	Group II	6.08±0.75

Non-significant difference between the groups.

The down time was no significant in goats of both the groups. Similar findings were reported by Saxena *et al.* (2001) [17],

down time of 4.33±1.17 in goats premedicated with atropine and romifidine.

Degree of sedation

Degree of sedation was evaluated by observing extent of head drop and salivation, drooping of ears and eyelids, respiratory pattern, resistance offered to flexion of the limbs, nystagmus and response to pain at 10 minutes after premedication in both the groups. The degree of sedation was similar in goats of both the groups premedicated with romifidine at 10 minutes. There was no difference once general anaesthesia was administered in both the groups. The observations made resembles to observations made by Saxena *et al.* (2001) [17] on intravenous administration of romifidine in goats immediately produced behavioural changes and exhibited weak time of 15.00±22.52 sec. However, Aithal (2000) [2] reported sedation was mild to moderate in goats administered with romifidine or romifidine -lignocaine lumbosacraly and maximum effect seen between 30 and 60 min Amarpal (2002) [23] reported that sign of sedation were observed relatively later than the onset of analgesia in goats administered with romifidine at the dose rate of 50 µg/ kg spinally.

Induction time

Table 7: Mean±S.E of Induction time (seconds) in goats of groups I and II

Parameter	Groups	Mean±S.E
Induction time(seconds)	Group I	53.16±2.12^{a}
	Group II	42.17±1.66^{b}

Means bearing superscript a, b differ significantly (p≤0.01) between the groups

Comparison between the groups revealed significant (p≤0.01) decrease in induction time in goats anaesthetised with propofol than with ketamine anesthetized goats which are in agreement with observations made by Prassinos *et al.* (2005) [24]. The rapid onset of action was caused by rapid uptake of propofol into the central nervous system. Short duration of action and rapid smooth emergence resulted from rapid redistribution from brain to the other tissues and efficient elimination from plasma by metabolism Zoran *et al.* (1993) [25].

Abolition of reflexes

At 0 minute before administration of romifidine all reflexes were present. 10 minutes of after romifidine premedication, the animals of both the groups showed less response to external stimulus. In animals the palpebral reflex depressed mildly after 10 minutes of romifidine administration but moderate response persisted in both the groups. At 30 and 60 minutes, the reflexes were absent in both the groups as the goats were under general anaesthesia. At 2 hours, all the reflexes were regained in both the groups, which are in agreement with the observations made by Saxena *et al*. (2001) [17] who reported that goats administered with atropine-romifidine did not respond to pin prick at flank region after 13.00±9.75 minute of romifidine injection.

Degree of analgesia and anaesthesia

The Mean±S.E scores of analgesia and anaesthesia in goats of group I before premedication (0 minute), 10 minutes after premedication and at 5, 30, 60 and 120 minutes after induction of general anaesthesia were 0.00±0.00, 1.50±0.22, 2.33±0.21, 2.83±0.16, 2.66±.21 and 0.00±0.00 respectively. Mild to moderate analgesia was noticed at 10 minutes of premedication with romifidine. The analgesia improved gradually and was excellent up to 60 minutes after induction with ketamine and maintenance with isoflurane anaesthesia. It was not noticeable at 120 minutes.

The Mean±S.E scores of analgesia and anaesthesia in goats of group II before premedication (0 minute), 10 minutes after premedication and at 5, 30, 60 and 120 minutes

After induction of general anaesthesia were 0.00±0.00, 1.33±0.21, 3.00±0.00, 3.00±0.00, 2.83±0.16 and 0.00±0.00 respectively. Analgesia was mild to moderate at 10 minutes of premedication with romifidine. Analgesia improved after induction of anaesthesia with propofol and maintenance with isoflurane and was excellent up to 60 minutes. It was not noticeable at 120 minutes.

The analgesia developed significantly (p≤0.01) at 10 minutes after premedication and persisted up to 60 minutes of anaesthesia in both the groups.

Comparison between the groups revealed no significant difference in analgesia throughout the observation period. However, at 5 minutes after induction, it was significantly (p≤0.01) better with romifidine-propofol- isoflurane than for romifidine-ketamine-isoflurane anaesthesia in goats**.**

Degree of muscle relaxation

Mild to moderate jaw relaxation was observed in all animals after premedication followed by excellent relaxation after induction in treatment romifidine-propofol However, jaws were moderately relaxed up to the end of 30 minutes anaesthetic period in romifidine- ketamine.

Table 8: Mean±S.E of score of muscle relaxation at different intervals in goats of groups I and II

Parameter	Time Intervals		Group I	Group II
Muscle relaxation	Before premedication	0 min	0.00±0.00	0.00±0.00
	After premedication	10 min	1.16±0.16**	1.16±0.16**
	After ketamine or propofol -isoflurane	5 min	1.50±0.22**^{a}	2.66±0.21**^{b}
		30 min	2.66±0.21**	3.00±0.00**
		60 min	2.83±0.16**	2.83±0.16**
		120 min	0.00±0.00	0.00±0.00

Means bearing superscript** differ significantly (p≤0.01) from interval 'before' within the group Means bearing superscript a, b differ significantly (p≤0.05) between the groups at corresponding intervals The Mean±S.E scores of muscle relaxation in goats of group I before premedication (0 minute), 10 minutes after premedication and at 5, 30, 60 and 120 minutes after induction of general anaesthesia were 0.00±0.00, 1.16±0.16, 1.50±0.22, 2.66±0.21, 2.83±0.16 and 0.00±0.00 respectively. Muscle relaxation was mild at 10 minutes after premedication with romifidine. It was moderate at 5 minutes after ketamine isoflurane anaesthesia and was excellent from 30 to 60 minutes. No muscle relaxation was

seen at 120 minutes.

The Mean±S.E scores of muscle relaxation in goats of group II before premedication (0 minute), 10 minutes after premedication and at 5, 30, 60 and 120 minutes after induction of general anaesthesia were 0.00±0.00, 1.16±0.16, 2.66±0.21, 3±0.00, 2.83±0.16, and 0.00±0.00 respectively. Mild to moderate muscle relaxation was seen at 10 minutes after premedication with romifidine. It was excellent from 5 minutes to 60 minutes after propofol-isoflurane anaesthesia and was not noticeable at 120 minutes.

The muscle relaxation was significantly ($p \leq 0.01$) greater at 10 minutes after premedication and also up to 60 minutes of anaesthesia in both the groups. Comparison between the groups revealed that, the degree of muscle relaxation was significantly ($p \leq 0.05$) greater at 5 minutes after induction of general anaesthesia in group II than group However, muscle relaxation was non-significantly better throughout the observation period in goats of group II premedicated with romifidine for propofol-isoflurane anaesthesia when compared to the goats of group I premedicated with romifidine for ketamine-isoflurane anaesthesia.

Table 9: Mean±S.E of score of analgesia and anaesthesia at different intervals in goats of groups I and II

Parameter	Time Intervals		Group I	Group II
Analgesia and anaesthesia	Before premedication	0 min	0.00±0.00	0.00±0.00
	After premedication	10 min	1.50±0.22**	1.33±0.21**
	After ketamine or propofol -isoflurane	5 min	2.33±0.21**[a]	3.00±0.00**[b]
		30min	2.83±0.16**	3.00±0.00**
		60 min	2.66±0.21**	2.83±0.16**
		120 min	0.00±0.00	0.00±0.00

Means bearing superscript** differ significantly ($p \leq 0.01$) from interval 'before' within the group Means bearing superscript a, b differ significantly ($p \leq 0.01$) between the groups at corresponding intervals

Degree of salivation

Table 10: Mean±S.E of score of degree of salivation at different intervals in goats of groups I and II

Parameter	Time Intervals		Group I	Group II
Degree of salivation	Before premedication	0 min	0.00±0.00	0.00±0.00
	After premedication	10 min	1.50±0.22**	1.16±0.16**
	After ketamine or propofol -isoflurane	5 min	2.50±0.22**[a]	1.33±0.21**[b]
		30 min	2.50±0.22**[a]	1.50±0.22**[b]
		60 min	1.66±0.21**	1.50±0.22**
		120 min	0.00±0.00	0.00±0.00

Means bearing superscript** differ significantly ($p \leq 0.01$) from interval 'before' within the group Means bearing superscript a, b differ significantly ($p \leq 0.05$) between the groups at corresponding intervals

Mild to moderate salivation was noticed at 10 minutes after premedication with romifidine. It increased after induction of general anaesthesia and moderate salivation was observed from 5 to 60 minutes. At 120 minutes, salivation was not appreciable.

The Mean±S.E scores of salivations in goats of group II before premedication (0 minute), 10 minutes after premedication and at 5, 30, 60 and 120 minutes after induction of general anaesthesia were 0.00±0.00, 1.16±0.16, 1.33±0.21, 1.50±0.22, 1.50±0.22, and 0.00±0.00 respectively. Mild to moderate salivation was noticed at 10 minutes after premedication with romifidine. It increased gradually after propofol-isoflurane anaesthesia and was mild from 5 to 60 minutes. Salivation was not appreciable at 120 minutes.

Significant ($p \leq 0.01$) increase in salivation was observed at 10 minutes after premedication and persisted up to 60 minutes after induction of general anaesthesia in both the groups. Comparison between the groups revealed significant increase in the salivation at 5 to 30 minutes of the study period among the goats induced with ketamine than that of goats induced with propofol for isoflurane anaesthesia.

Time to regain sternal position (minutes)

The time taken by the goats to attain sternal recumbency after general anaesthesia ranged from 18 to 23 minutes in group I and 12 to 14.5 minutes in group II. The Mean±S.E values of time to regain sternal recumbency was 21.00±0.85 and 13.83±0.56 minutes in group I and group II respectively.

Time to attain sternal position was significantly ($p \leq 0.01$) quicker in goats anesthetized with romifidine-propofol-isoflurane than that of goats anesthetized with romifidine for ketamine-isoflurane anaesthesia. The similar findings were recorded by Kumandas and Elma (2015) [26] who reported that time to attain sternal recumbency was 16.43±6.88 minutes after termination of propofol- isoflurane anaesthesia in goats.

Table 11: Mean±S.E of time to regain sternal position (minutes) in goats of groups I and II

Parameter	Groups	Mean±SE
Time to regain sternal recumbency (minutes)	Group I	21.00±0.85[a]
	Group II	13.83±0.56[b]

Means bearing superscript a, b differ significantly ($p \leq 0.01$) between the groups

Time to regain standing position (minutes)

The time taken by the goats to attain standing position on their own after general anaesthesia ranged from 38 to 58.50 minutes in group I and 19.20 to 23.50 minutes in group The Mean±S.E values of time to regain standing position was 49.91±3.58 minutes and 22.20±0.73 minutes in group I and group II respectively. Goats of both the groups took 2-3 attempts to stand up with hind limbs held apart with head down.

Table 12: Mean±S.E of time to regain standing position (minutes) in goats of groups I and II

Parameter	Groups	Mean±SE
Time to regain standing position (minutes)	Group I	49.91±3.58[a]
	Group II	22.20±0.73[b]

Means bearing superscript a, b differ significantly ($p \leq 0.01$) between the groups

Time to attain standing position was significantly ($p \leq 0.01$) quicker in goats anesthetized with romifidine-propofol-isoflurane than that of goats anesthetized with romifidine-ketamine-isoflurane anaesthesia. However, transient excitement, struggle to stand and moderate ataxia were observed in three goats of group II. In our study the time taken by the goats to attain standing position on their own after general anaesthesia ranged from 38 to 58.50 minutes in group I and 19.20 to 23.50 minutes in group II.

Conclusion

Clinical observations revealed that the onset of sedation in goats of group I and group II were ranged from 10 to 25 sec. Romifidine shows faster onset of sedation in both the groups. Down time to sternal recumbency in goats of both groups were ranged from 4.3 to 8.5 minutes Early down time to sternal recumbency was recorded in goats of both groups. The degree of sedation was similar in goats of both the groups. Degree of analgesia and muscle relaxation were comparatively better in goats premedicated with romifidine and induced with propofol (Group II) than in goats induced with ketamine The analgesia and muscle relaxation in goats of both the groups were excellent up to 60 minutes after administering ketamine and propofol isoflurane, as the goats were under general anaesthesia. Significant ($p \leq 0.01$) increase in salivation was observed at 10 minutes after premedication and persisted up to 60 minutes after induction of general anaesthesia in both the groups. Comparison between the groups revealed significant increase in the salivation at 5 to 30 minutes of the study period among the goats induced with ketamine than that of goats induced with propofol for isoflurane anaesthesia. The preanesthetic and the general anaesthetic combinations followed in both the groups were ideal to perform major surgeries without any complications.

Recovery time to regain sternal position after general anaesthesia in goats of group I and group II were 21.00±0.85 and 13.83±0.56minutes respectively. Recovery time to assume standing position in goats of group I and group II after general anaesthesia were 49.91±3.58 and 22.20±0.73 minutes respectively. The recovery time to regain sternal position and to assume standing position was significantly faster in goats premedicated with romifidine for Propofol -isoflurane (Group II) general anaesthesia when compared with goats premedicated with romifidine for ketamine-isoflurane anaesthesia (Group I).

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